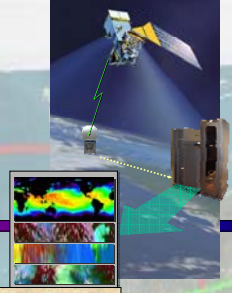
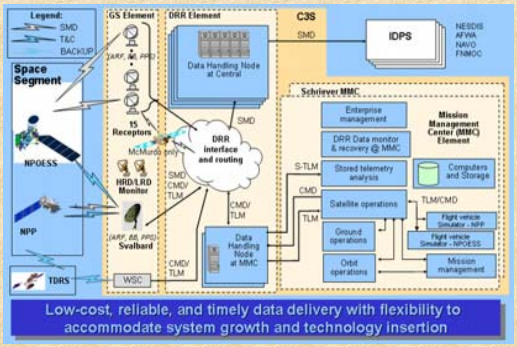
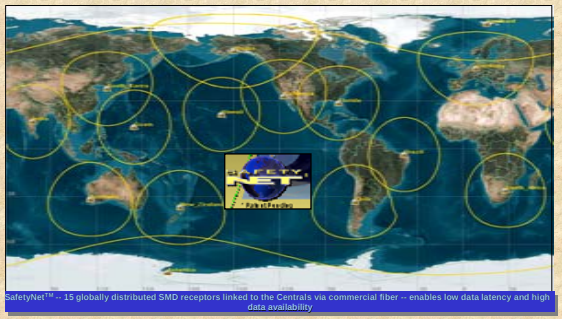
# National Polar-orbiting Operational Environmental **Satellite** System (NPOESS)

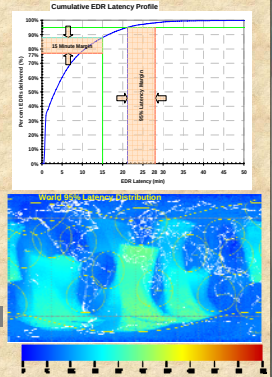


## Command, Control, and Communications Segment




Architecture Supports Low Mission Data Latency




### Command, Control & Communications Segment (C3S)
Features & Functions

**Manage Mission**
- Mission guidance
- External reporting
- Plan mission events
- Build command segment
- Maintain satellite databases

**Manage Satellite Operations**
- Monitor and control satellite
- Prepare and send commands
- Perform engineering and analysis
- Analyze flight dynamics
- Simulate satellite
- Maintain flight S/W

**Space/Ground Communications**
- Control ground communications
- Position antennas
- Uplink satellite loads
- Receive telemetry
- Receive Stored Mission Data (SMD)
- Monitor High-Rate & Low-Rate Direct Readout Data (HRD/LRD)
- Preprocess downlinked data
- Compare received vs. transferred

**Data Routing and Retrieval**
- Provide inter-segment communications
- Provide intra-segment communications for C3 and Data Processing Segments
- Data monitor and recovery

**Key Architecture Features:**
- Polar Telemetry & Control (T&C) ground station with no blind orbits
- SafetyNet™ mission data receptors
- Data routing through commercial network
- Redundant Mission Management
- Distributed data monitoring and recovery and front-end processing
- Local network infrastructure at each site
- Use of established product lines for mission management

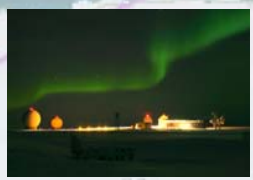
### C3 Segment Design

SvalSat
Svalbard Satellite Station
Norwegian Space Centre

- Ground Station (GS) element provides reliable and timely space-ground connectivity
  - Svalbard Polar GS for NPP SMD, NPP/NPOESS T&C, HRD/LRD monitoring
  - Global receptors for NPOESS SMD
  - White Sands Center (WSC) for launch, early-orbit & acquisition (LEO&A), emergency backup, and NPP calibrations
- Data Recovery & Retrieval (DRR) element provides reliable and secure data delivery
  - Svalbard fiber to CONUS
  - CONUS wide-area network
  - Data handling & front-end processing of SMD at each Central Data Processor
  - Front-End Telemetry & Command Encryption Processing at MMC
  - Local network infrastructure at each site
- Mission Management Center (MMC) element provides insight and oversight of total operations
  - Mission operations planning, monitoring, and control
  - Satellite and C3S ground resource management
  - Computer & storage infrastructure at each site
  - Primary MMC used initially for NPP with operations expanded for NPOESS
  - Schriever MMC comes online prior to launch of the first NPOESS satellite

### C3 Segment - Current Status

- **NPP Development Progressing Well**
  - Contract Award – August 2002
  - Software Builds completed (86% S/W Re-use demonstrated; >1.7M Lines of Code delivered)
  - 40 Hardware Racks completed – 6 Racks deployed
  - Deployments underway to: NOAA, Air Force Weather Agency, White Sands, and Svalbard
- **Key Risk Reduction efforts**
  - Early operations support at Svalbard for Windsat-Coriolis, Aqua, Aura, Terra, and POES
    - Antenna & support equipment in place & operational at Svalbard
    - Fiber communications Svalbard-to-NOAA/NASA in place & operational
  - Early Landing Rights discussions with potential receptor host countries
- **NPOESS C3S will evolve from NPP**



**Bottom-Line Summary:**
- **Revolutionary Engineering -- innovation, products re-use and processes.**
- **Successful C3S through Eclipse, software re-use and strong systems integration to deliver 1.7M SLOC system in 3 years.**
- **NPOESS demonstrates the way to future on developing large-scale ground system – reliable, affordable & delivered on schedule.**

NORTHROP GRUMMAN
Raytheon